UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

ANALYSING THE EFFECTS OF THE PARAMETERS IN DYNAMICAL MODEL IN THE SPREAD OF HIV

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

Each year, the number of those who died from HIV are increasing. There are several factors that are identified as the major cause of spreading of HIV in a population. But, in this study, only consider two factors that are the unsafe sex and sharing of contaminated needles. Therefore, a dynamic mathematical model will be studied to find out about the spread of HIV in a population. Through the mathematical model, there are two variables were involved, namely the number of individuals carrying HIV and the number of individuals who are free from HIV. Next, made a search for equilibrium points of the model. As a result, there are two equilibrium points are obtained that are the free disease equilibrium point and the endemic equilibrium point. Through these solutions, know that the free disease equilibrium point has a trivial solution and the endemic equilibrium point has non-trivial solution. In addition, the stability of the both equilibrium points can be analyzed by using two methods that are the methods which involves the eigenvalues of the Jacobian matrix and the Routh-Hurwitz criteria. Thus, can determine the type of equilibrium points which involved namely node, focus and saddle point. Then, the equilibrium points can also be determined whether it will stable or unstable. To further this study, the relationship between the group infected by HIV and the group not infected by HIV are also discussed.

1 INTRODUCTION

1.1 Research Backgroud

The immune system can be defined as a system of many biological structures and processes an organism which function to protect against disease. These systems function as defend system of human body from infection and disease organisms or foreign molecules such as bacteria, parasites, fungi and viruses. The immune system in many species can be classified into subsystems, such as the innate immune system versus the adaptive immune system, or humeral immunity versus cell-mediated immunity. One of the dangerous disease that can attack and weaken the immune system is AIDS or Acquired Immune Deficiency Syndrome , which is caused by the presence of HIV or Human Immunodeficiency Virus. According to Tapadar et al. (2011), in the 20th century, AIDS was first detected in Sub - Saharan Africa.

HIV will give a very negative impact on existing systems in the human body by way of undermining and damaging the immune cells in the blood. This virus will combine with lymphocytes of helper T cells and CD4 cells. This lymphocyte cells have a very important function in the immune system and resistance of the human body. This resulted in HIV a chance to live in the body of the human body for many years by means of breeding, which produces thousands of HIV virus origin of only one cell lymphocytes. Consequently, the number of helper T cells decreases and the immune system becomes weak until it reaches a certain level and the immune system is less resistance to disease. At this stage, the patient is said to have AIDS. AIDS is the final phase of those infected with HIV. AIDS is an illness in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to blossom.